

ABSTRACT

A semiconductor device includes a single crystal substrate and a dielectric layer overlying the substrate. The dielectric layer includes at least one opening having a first portion and an overlying second portion. The first portion has a depth and width, such that an aspect ratio of the depth to width is greater than one. The semiconductor device further includes a first material having a first portion and a second portion, the first portion of the first material filling the first portion of the at least one opening. Defects for relaxing strain at an interface between the first material and the substrate material exist only within the first portion of the first material due to the aspect ratio being greater than one. The second portion of the first material is substantially defect free. Furthermore, the second portion of the first material and an overlying second material different than the first material fill the overlying second portion of the at least one opening. The second material has a thickness which is less than a critical thickness to maintain the second material in a strained state. The strained second material functions as a channel for charge carriers.